ABSTRACT

Effect of Aperture Averaging on a 570 Mbps 42 km 1 Iorizontal Path Optical 1 ink

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Optical communications offers high data rate satellite to ground communications in a small, low mass, and low power consumption package. However, atmospheric t urbulence causes scintillation of the optical signal and degrades the link performance as the zenith angle increases. '1'0 investigate the effect of atmospheric turbulence on the optical link at low elevation angles, we. have performed a 570 Mbps optical communications link across a 42 km horizontal path, and have measured the effects of aperture averaging on the log amplitude variance, σ_x^2, and on the power spectral density of the scintillation. The σ_x^2 results show that the variance saturates around (),35 for apertures smaller than 4 cm and that it decreases rapidly to ().()5 as the receiver aperture is increased to 21 cm. The power spectral density also shows a marked dependence on aperture size, with a distinct maximum around 20117, at the smaller apertures, becoming less pronounced as the aperture size increased. The measured bit error rates were dominated by burst errors and ranged from $1()^{-6}$ to $1()^{-2}$ for the various aperture. sizes. The results demonstrate that aperture averaging can be used to mitigate the effects of turbulence-induced burst errors for low elevation angle links.

Biography

Keith Wilson received his B. Sc. (1 ions) from California State Polytechnic University at Pomona, and M .A. and Ph.D. degrees from the Universit y of Southern California, all in Physics. 1 Ie was a researcher at the Hughes Research Labs, Malibu, and has held positions as Assistant Professor at California State Polytechnic University at Pomona, Post Doctoral Fellow at the Center for Laser Studies, USC, Sr. Development Engineer at Allied Corporation, and Member of the Technical Staff and a group leader at Litton Guidance and control Systems. He joined JPL in 1988 as a Member of the Technical Staff, and in 1989 he was appointed the '1'ask Manager for the Galileo optics] Experiment that successfully demonstrated the first laser beam transmission to a spacecraft in deep-sJ>acc. 1 Ie currently manages the ground reception and propagat ion segment of J PL's research program in deep space optical communications. Dr. Wilson has published over a dozen papers in laser physics, and integrated optics, holds three US patents in fiber optics gyroscope technology. He is a member of the SPIE (Society of Photo-Optical Instrumentation Engineers) Program Committee on Free Space Laser Communication Technology.